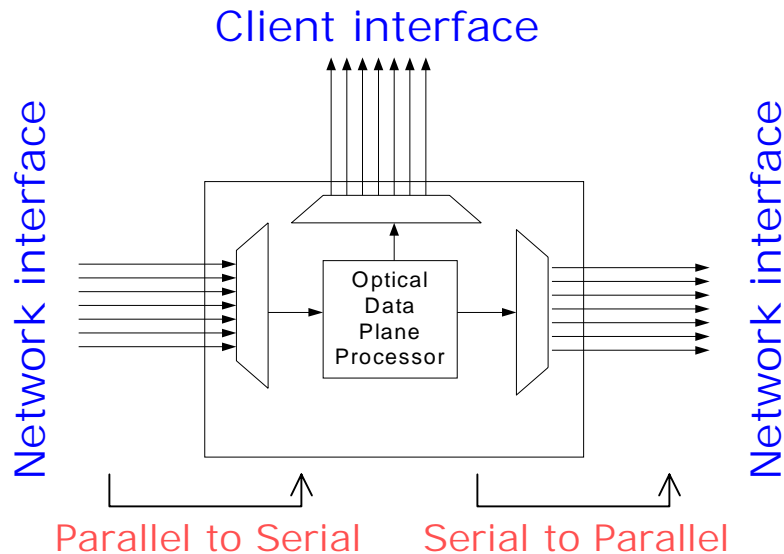


Considerations to enable data networking in the optical domain

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Celion Networks**

**DARPA Workshop
Tuesday, March 18, 2003**

Node for high-speed optical processing



■ Network level issues

- Signaling
- Latency
- Network capacity, loading, routing
- Signal must interface with transmission network

■ Node Issues

- Buffering
 - Storage?
 - Delays—interface with transmission
- Baseline against O/E/O and Si processing

■ Processor Issues

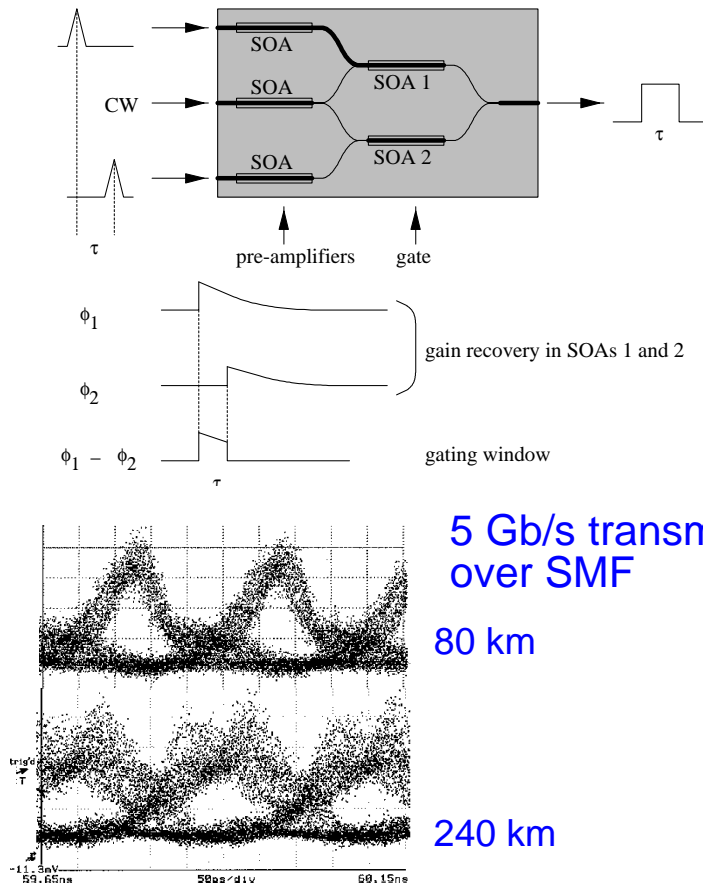
- Nature of processing
- Parallel \leftrightarrow Serial conversion
 - Wavelength grouping
 - Synchronization of wavelength clocks
 - Jitter
 - Effects caused by nonlinearities.
 - Group signals for transmission

Transmission Issues

- Modulation format
 - RZ optimized for transport and some signal processing.
- Bit rate: transport vs. processing.
 - Transport: consistent with necessary reaches, capacity, etc.
 - Processing: minimize components.
 - Interconversion:
 - Serial to parallel processing.
 - Clock, skew, and jitter issues.
- Signal quality and its effects on transport and cascadability.
 - Power levels and power balance
 - Nonlinear effects
 - Signal-to-noise ratios
 - Pulse duration
 - Chirp
 - Dispersion consequences

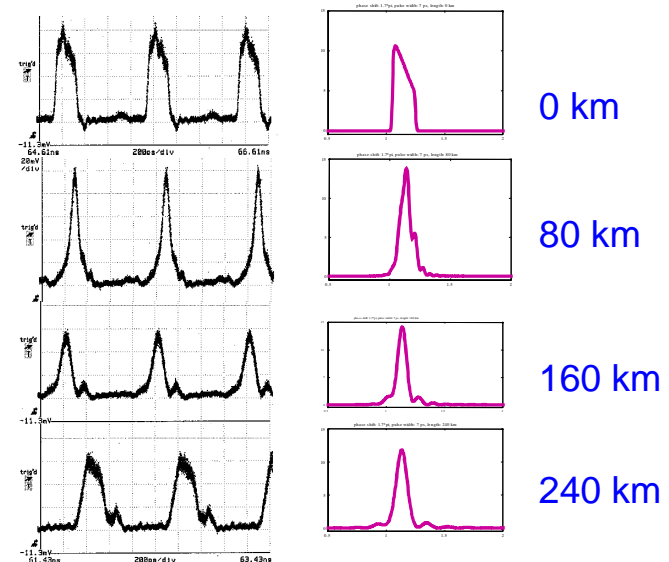
Example: Transmission consequences of RZ-NRZ format conversion

NRZ formation using MZ optical-optical gate



Chirp at transitions distorts signal and degrades transmission

Experiment vs simulation

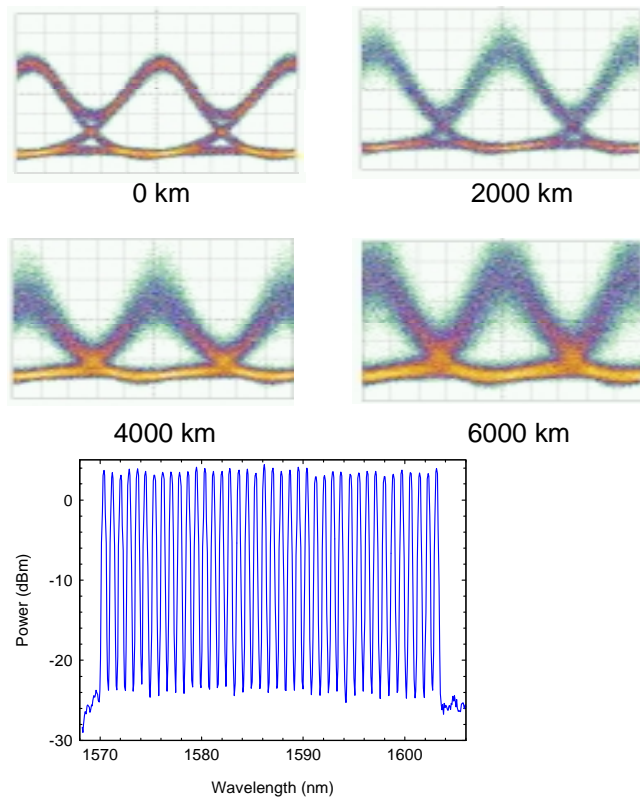


S.-G. Park, L. H. Spiekman, M. Eiselt, J. M. Wiesenfeld, Photon. Tech. Lett., 12, 233 (2000).

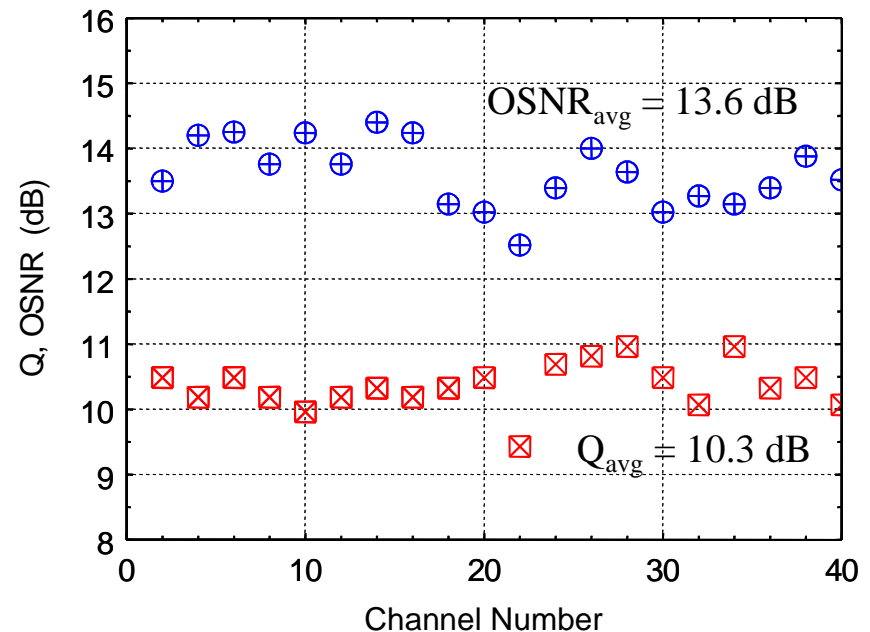
Celion Networks

- Expertise in high-speed, high-capacity systems and data networks.
 - Data Networks:
 - Jeff Cox, CSA, formerly chief IP Architect for Level 3
 - Optical Networks
 - Bob Tkach, CTO, Michael Eiselt, Lara Garrett, Jay Wiesenfeld, formerly AT&T Labs, Bell Labs.
 - Capabilities:
 - High-capacity WDM to 40 Gb/s.
 - Simulation and interpretation.
 - History of working with innovative component and subsystem groups.

Example: Loop transmission at 12.5 Gb/s



6100 Km transmission



Systems issues include: modulation format, dispersion map, power and power balance, nonlinearities, channel spacing, FEC, ...full set of interacting parameters.